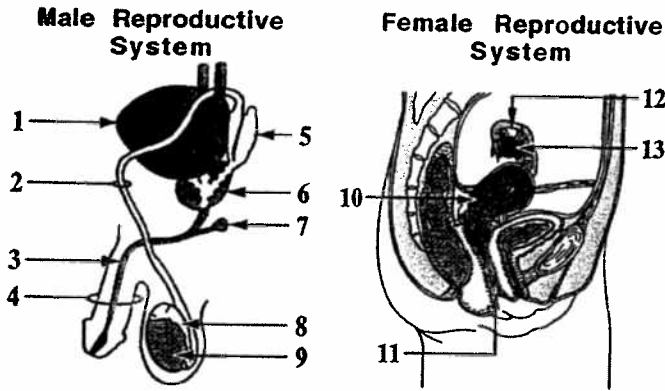


# REPRODUCTIVE SYSTEMS AND HORMONES

Use the following information to answer the next two questions.



## Numerical Response

1. % Correct 36.7

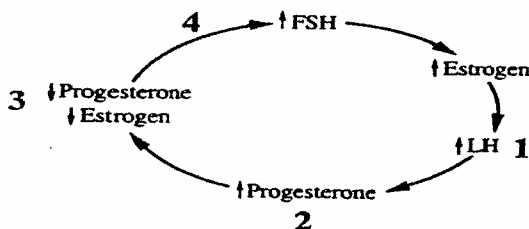
What are the structures that are responsible for the production of the components of semen?

Answer: \_\_\_\_\_  
(Record your answer in lowest-to-highest numerical order.)

1. The structures that are directly affected by hormones secreted from the pituitary gland are structures

A. 6, 9, and 10      B. 9, 10, and 13  
C. 8, 10, and 11      D. 8, 11, and 13

2. Hormones of the Menstrual Cycle



Legend: ↑ increasing levels of  
↓ decreasing levels of

What point on the diagram is best matched with the correct event?

- A. Point 1—ovulation  
B. Point 2—menstruation  
C. Point 3—formation of the follicle  
D. Point 4—formation of corpus luteum

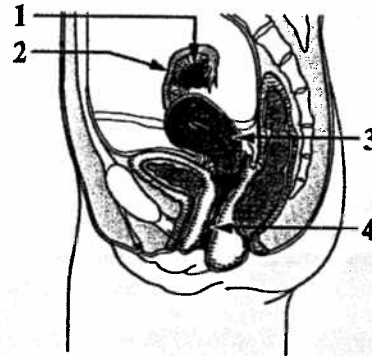
3. Before eggs are harvested for *in vitro* fertilization, hormone supplements are given to the egg donor to ensure that mature ova will be available. Harvested eggs are fertilized and inserted into the recipient's uterus.

Which hormone, if given to the egg donor, would promote the growth and development of ova?

- A. LH                      B. FSH  
C. Estrogen              D. Progesterone

Use the following information to answer the next two questions.

## Female Reproductive System



## Endometriosis

In some women, endometrial cells migrate from the uterus to other places in the body, such as surfaces of reproductive organs and organs of the urinary system. This misplaced endometrial tissue responds to hormones in the blood in the same way as the normal endometrium. This causes pain and may severely damage the organ to which the tissue is attached. Women who have endometriosis do not experience these symptoms during pregnancy. Treatment for endometriosis includes removing excess tissue with lasers or using hormone therapy to mimic pregnancy.

4. Which hormones would be used in the hormone therapy treatment of endometriosis?

- A. FSH and LH  
B. LH and estrogen  
C. FSH and progesterone  
D. Progesterone and estrogen

5. The process of fertilization would be directly affected by scarring resulting from endometriosis in structure

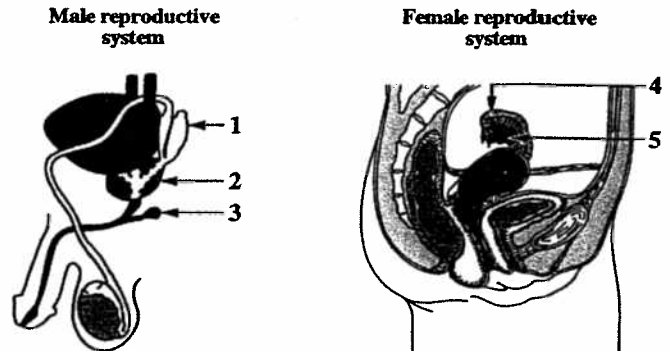
- A. 1                      B. 2  
C. 3                      D. 4

6. At the embryonic level, there is not much difference between being male and being female. At the University of Texas, researcher M. D. Anderson discovered a point in embryonic development when ovaries are present in females and testes are present in males, but in each sex, both sets of ducts (vas deferens and oviducts) coexist. In the female, the lack of testosterone causes the vas deferens to simply wither away. In the male, a second hormone, Müllerian inhibiting hormone (MIH), suppresses the development of female ducts. The MIH gene is located on the X chromosome but has no function identified yet in females.

If a substance was present in the embryo that inactivated the MIH hormone, male babies would be born with

- A. female reproductive ducts and male sex chromosomes  
 B. male reproductive ducts and female sex chromosomes  
 C. male reproductive ducts and female secondary sexual characteristics  
 D. female reproductive ducts and female secondary sexual characteristics
7. At puberty, the LH in the human male directly
- A. inhibits the production of sperm  
 B. stimulates the production of testosterone  
 C. causes the growth of facial and body hair  
 D. stimulates the maturation of the seminiferous tubules
8. In females, the onset of puberty is initiated by secretions from the
- A. follicle                      B. endometrium  
 C. corpus luteum              D. hypothalamus
9. In males, a *Chlamydia* infection may cause inflammation in areas of the reproductive system. The maturation and storage of sperm might be directly affected if inflammation occurs in the
- A. epididymis                  B. vas deferens  
 C. prostate gland              D. seminal vesicles
10. A thick and vascularized endometrium
- A. remains when progesterone levels and estrogen levels both decrease  
 B. is present when an egg is fertilized and progesterone levels decrease  
 C. is present when an egg is fertilized and progesterone levels remain high  
 D. remains when progesterone levels decrease and estrogen levels remain high

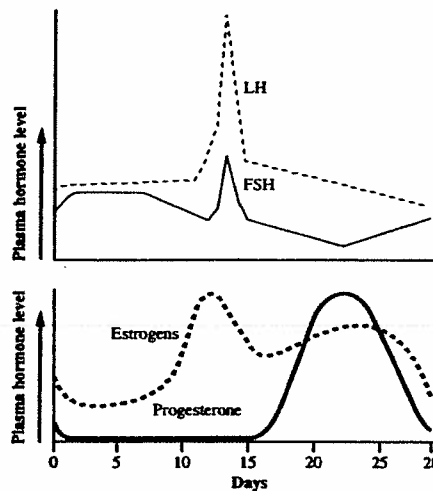
Use the following information to answer the next two questions.



11. The collective function of structures 1, 2, and 3 is the production of components of
- A. urine                              B. sperm  
 C. semen                             D. testosterone
12. The row that identifies the structures in the male that have similar functions to structures 4 and 5 in the female is

Row	Structure 4	Structure 5
A.	vas deferens	testes
B.	vas deferens	prostate gland
C.	seminiferous tubules	testes
D.	seminiferous tubules	prostate gland

13. Changing Levels of Hormones During the Menstrual Cycle



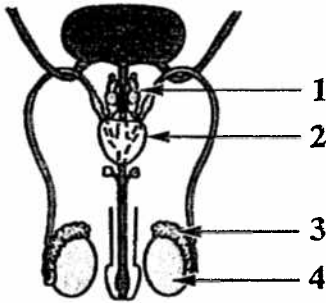
Which hormone is at its lowest level at the time of ovulation?

- A. LH                                      C. Estrogen  
 B. FSH                                    D. Progesterone

14. Milk production and the release of milk, respectively, are stimulated by the hormones

- A. estrogen and oxytocin
- B. prolactin and oxytocin
- C. estrogen and progesterone
- D. prolactin and progesterone

15. Male Reproductive System



The structure that may function both as a site for spermatogenesis and as an endocrine gland is labelled

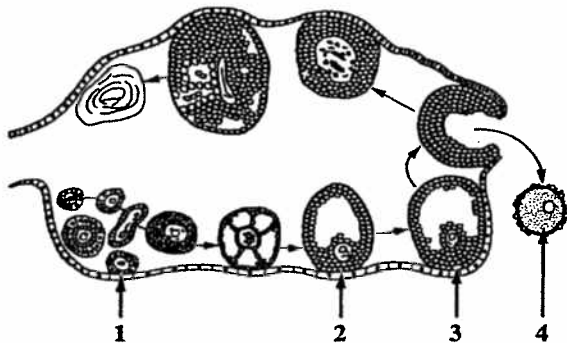
- A. 1
- B. 2
- C. 3
- D. 4

16. An unusual and rare form of the disease cystic fibrosis results in the absence of the vas deferens in males.  
—from Henahan

When this occurs, infertility results because of

- A. decreased spermatogenesis
- B. an inability to maintain an erection
- C. decreased secretions of alkaline buffers
- D. the failure of sperm to reach the urethra

17. Composite Diagram of a Human Ovary



This diagram shows the sequence of events in the development of a follicle in one reproductive cycle of a non-pregnant female.

The part of the diagram that represents the follicle just before day 14 of an average ovarian cycle is labelled

- A. 1
- B. 2
- C. 3
- D. 4

18. % Correct 58.7

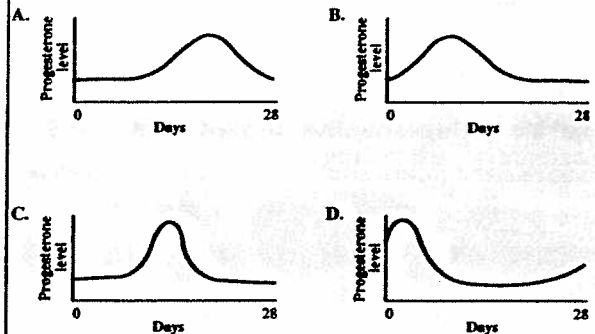
Microscopic examination has revealed protective layers surrounding the oocyte. The first sperm to reach the oocyte is usually not the one to fertilize it.

The reason this first sperm may not fertilize the oocyte is that

- A. its nucleus may not be acceptable for fertilization
- B. some sperm produce enzymes that fail to break down the protective layers
- C. the enzymes from many sperm are needed to penetrate the protective layers
- D. the protective layers secrete chemicals that destroy many sperm that contact the oocyte

19. % Correct 58.7

A graph that illustrates the cyclical variation in progesterone levels in one reproductive cycle of a non-pregnant human female is



20. It has been observed that some breastfeeding mothers do not ovulate until they stop breastfeeding. Ovulation would not occur if

- A. prolactin inhibits the release of oxytocin
- B. prolactin inhibits follicular development
- C. oxytocin stimulates the release of FSH and LH
- D. oxytocin stimulates the release of gonadotropin-releasing hormone

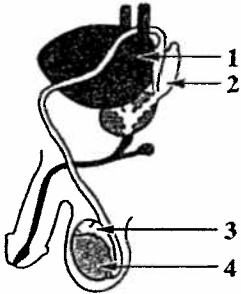
21. HGH is a protein. Biosynthetic HGH is used in the treatment of Turner syndrome, a disorder occurring in females as a result of nondisjunction; the sex chromosome complement is XO instead of the normal XX. Untreated females with Turner syndrome grow only to the height of an average ten-year-old.  
—from Leger, 1994

In humans, HGH directly stimulates the

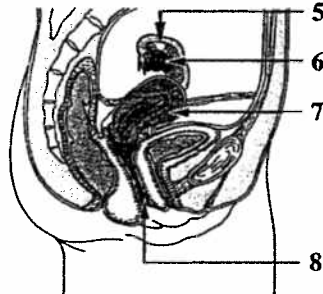
- A. gonads
- B. adrenal glands
- C. muscles and peripheral nerves
- D. long bones and skeletal muscles

**Numerical Response**

**2** Reproductive System of a Human Male



Reproductive System of a Human Female



The target organs for FSH in the male and the female are labelled, respectively, \_\_\_\_\_ and \_\_\_\_\_.

Answer: \_\_\_\_\_

**Numerical Response**

**4** Functions of the Four Main Reproductive Hormones in Human Females

- 1 Stimulation of egg development
- 2 Inhibition of ovulation and uterine contractions
- 3 Stimulation of the development of secondary sex characteristics
- 4 Stimulation of ovulation and formation of the corpus luteum

Identify the major function, as numbered above, of each of the hormones given below.

Function: \_\_\_\_\_  
 Hormone: FSH LH Estrogen Progesterone  
 (Record your four-digit answer.)

Use the following information to answer the next two questions.

*In vitro* fertilization techniques can enable postmenopausal women (those who have gone through menopause) to have babies. Eggs are removed from a female donor and are fertilized in a culture dish. The early embryo is inserted into the uterus of the postmenopausal woman. The postmenopausal woman requires hormone supplements for implantation and development to succeed.

23. To increase the chance of successful implantation of an embryo produced by *in vitro* fertilization, the postmenopausal woman must receive

- A. FSH and LH to promote the development of the follicle
- B. FSH and LH to promote the development of the endometrium
- C. estrogen and progesterone to promote the development of the follicle
- D. estrogen and progesterone to promote the development of the endometrium

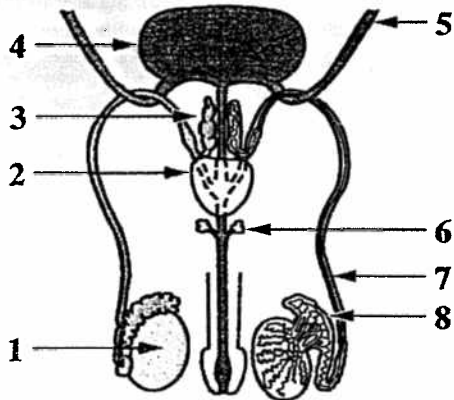
24. During the first trimester of a pregnancy, an extraembryonic membrane secretes HCG. In a pregnancy resulting from *in vitro* fertilization of a postmenopausal woman, HCG would not function normally because the

- A. woman's pituitary would not respond
- B. placenta would not produce FSH or LH
- C. woman would not have a corpus luteum
- D. placenta would not be permeable to hormones

**Numerical Response**

**3** % Correct 45.4

**The Male Reproductive System and Accessory Structures**



Identify the three structures, as numbered above, that produce the fluid secretions that make up semen.

Answer: \_\_\_\_\_  
 (Record your three-digit answer in lowest-to-highest numerical order.)

22. In humans, the temperature within the scrotum is usually

- A. above body temperature
- B. below body temperature
- C. the same as body temperature
- D. the same as room temperature

25. The hormone that stimulates sex-cell production in both males and females is

- A. LH
- B. FSH
- C. testosterone
- D. progesterone

26. The development of secondary sexual characteristics in the female is due to the secretion of

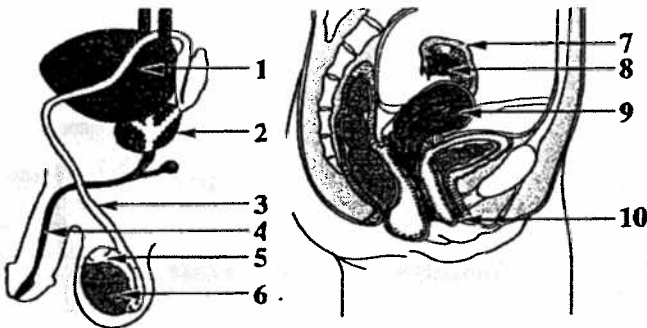
- A. LH, followed by the secretion of estrogen
- B. LH, followed by the secretion of progesterone
- C. FSH and LH, followed by the secretion of estrogen
- D. FSH and LH, followed by the secretion of progesterone

27. Which area of the brain regulates male or female reproductive behaviour by directly controlling the release of gonadotropins from the pituitary gland?

- A. Hypothalamus
- B. Pituitary gland
- C. Medulla oblongata
- D. Frontal lobe of the cerebrum

Use the following information to answer the next two questions.

**Human Male and Female Reproductive Systems**



28. Meiosis occurs in which male and female structures, respectively?

- A. 6 and 9
- B. 6 and 8
- C. 5 and 9
- D. 5 and 8

29. Reproductive structures that have similar functions in males and females are, respectively,

- A. 4 and 10
- B. 3 and 7
- C. 2 and 8
- D. 1 and 9

30. Collectively, the seminal vesicles, prostate gland, and Cowper's glands contribute to which of the following functions?

- A. Produce testosterone
- B. Stimulate spermatogenesis
- C. Help sperm survive in the female body
- D. Signal the pituitary to release gonadotropins

31. In rare cases, human males develop functioning mammary glands. Hormone levels are known to affect the development and function of mammary glands in both males and females.

For human males to produce milk and to eject milk, high levels of which two hormones, respectively, must be present?

- A. Prolactin and relaxin
- B. Relaxin and prolactin
- C. Prolactin and oxytocin
- D. Oxytocin and prolactin

32. William Hunter was born without vas deferens. Despite surgery and attempts at artificial insemination and conventional *in vitro* fertilization, William and his wife were unable to conceive.

—from Shirk, 1994

A new technology that may help William involves sperm extraction followed by sperm injection to produce a fertilized egg. This technology must involve

- A. LH therapy
- B. testosterone therapy
- C. extraction of sperm from the male's urethra
- D. extraction of sperm from the male's epididymis

**Numerical Response**

**5. Reproductive Events in a Mature Human Female**

- 1 Ovulation
- 2 Placenta forms
- 3 Fertilization
- 4 Implantation

The above events, in the sequence in which they occur before childbirth, are \_\_\_\_\_ .  
(Record your four-digit answer.)

33. Compared with premenopausal women, women entering menopause have increased levels of FSH and LH. These women can choose to undergo estrogen and/or progesterone hormone replacement therapy to alleviate the symptoms of menopause.

If a menopausal woman takes hormone replacement therapy, the levels of her FSH and LH will

- A. not be affected because her ovaries no longer respond to estrogen
- B. cause the ovary to produce eggs, and the woman will again be fertile
- C. drop because of the negative-feedback effect of progesterone and estrogen
- D. rise as estrogen and progesterone levels stimulate the production of FSH and LH

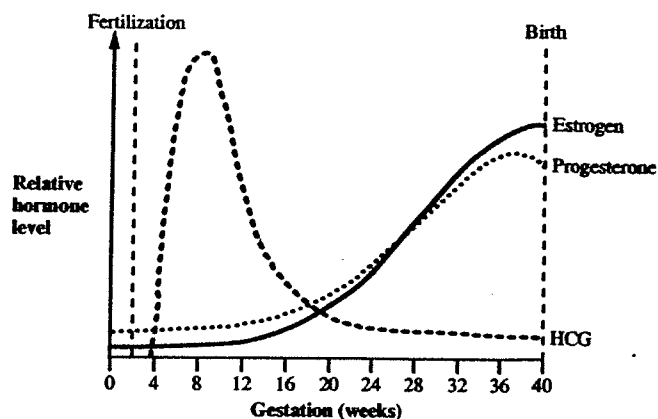
34. Hormones that stimulate the production of testosterone are transported by the
- blood
  - vas deferens
  - seminiferous tubules
  - ducts from the gland secreting the hormones

\* \* \* \* \*

## DIFFERENTIATION & DEVELOPMENT

1. During the process of implantation, the enzymes secreted by the
- ovum digest the zygote membrane
  - sperm digest the zygote membrane
  - blastocyst digest a portion of the endometrium
  - blastocyst digest a portion of the corpus luteum

3. Hormone Levels in Blood Plasma Before and During Pregnancy



2. **% Correct 52.1**

One of the major differences between the female and the male sex chromosome genotype is that the male genotype causes the developing genital ridge, which later produces external sex organs, to secrete testosterone, while the female genotype causes this ridge to secrete estrogens. Injection of relatively large quantities of testosterone into pregnant animals produces male sex organs in a fetus, even if the fetus is genotypically female.

Which is a logical inference derived from this information?

- Male and female embryos would be anatomically similar at one stage of their development.
- The genital ridge would continue to secrete sex hormones during the remaining seven months of pregnancy.
- Injection of large quantities of testosterone into a pregnant female would change the sex chromosomes of the developing embryo.
- Injection of large quantities of estrogen into a pregnant female would enhance the development of existing sex organs in the embryo.

The increasing level of HCG from the time of fertilization until week 8 serves to

- maintain the function of the corpus luteum
  - determine the sex of the developing embryo
  - inhibit the development of the endometrium
  - direct the processes of ovulation and fertilization
4. Removal of the mother's ovaries before the seventh week of pregnancy leads to a miscarriage. After 12 weeks, removal of the ovaries usually has no effect on pregnancy. An explanation for these observations is that
- after 12 weeks, the endometrium is easily shed
  - after 12 weeks, the placenta maintains the pregnancy
  - the follicle remains well developed for at least 12 weeks
  - implantation is not firmly established until the 12th week

**Numerical Response**

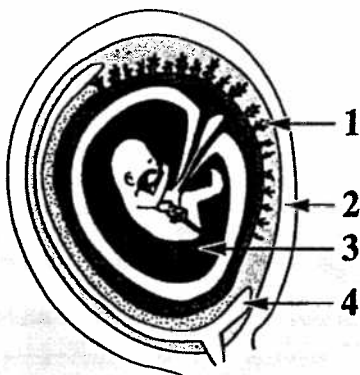
**1. Events That Occur During Breast Feeding (Arranged in Random Order)**

- 1 Release of milk
- 2 Release of oxytocin
- 3 Suckling action of the baby
- 4 Stimulation of sensory neural pathways from the breast to the hypothalamus-pituitary complex

Sequence the events that occur during breast feeding

Answer: \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_  
(Record your four-digit answer.)

**5. A Developing Fetus and Associated Structures**



During labour, smooth muscle contractions occur in structure

- A. 1                      C. 3  
B. 2                      D. 4

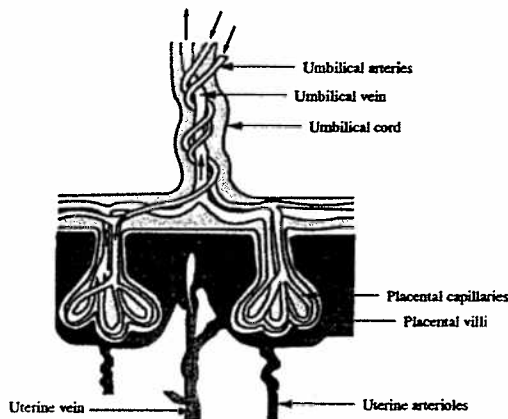
**Numerical Response**

<p><b>2. % Correct 59.3</b></p> <p><b>Processes in Human Reproduction</b></p> <ol style="list-style-type: none"> <li>1 ovulation</li> <li>2 parturition</li> <li>3 fertilization</li> <li>4 implantation</li> </ol> <p>Identify the sequence of the processes in human reproduction. Answer: _____ (Record your four-digit answer.)</p>
---

**6. Which hormone induces uterine contractions?**

- A. Relaxin                      B. Prolactin  
C. Oxytocin                      D. Progesterone

**7. A Schematic View of the Placenta**

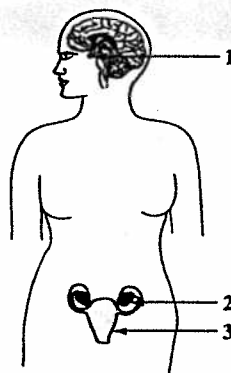


—from Curtis

Which of the following does not normally occur at the placenta?

- A. Nutrients move from the maternal blood to the fetal blood
- B. Blood cells move from the maternal blood to the fetal blood
- C. Carbon dioxide moves from the fetal blood to the maternal blood
- D. Metabolic wastes move from the fetal blood to the maternal blood

**8. Some Structures of the Human Female**



The gland that releases oxytocin and the target organ for oxytocin are labelled, respectively,

- A. 1 and 2                      B. 1 and 3  
C. 2 and 1                      D. 2 and 3

**9. Which of the following statements about normal human fertilization is correct?**

- A. Fertilization occurs in the uterus of the woman.
- B. Fertilization occurs in a simple, one-step process.
- C. Fertilization involves the use of enzymes by sperm.
- D. Fertilization involves the replication of chromosomes.

10. Birth control pills prevent pregnancy. One form of birth control pill works by mimicking some characteristics of pregnancy. A direct result of using this birth control pill is that during most of the menstrual cycle
- increased and sustained levels of LH are released from the pituitary
  - increased and sustained levels of FSH are released from the pituitary
  - progesterone and estrogen levels are maintained at a relatively low level
  - progesterone and estrogen levels are maintained at a relatively high level

### Numerical Response

#### 3. Events That Occur When Lactation is Initiated by the Feeding Action of a Baby

- Release of oxytocin into the blood
- Transmission of nerve impulses to the hypothalamus
- Contraction of smooth muscle in the gland
- Stimulation of sensory nerve endings in the breast

The sequence of events that occurs when lactation is initiated by a baby is \_\_\_\_\_.

Answer: \_\_\_\_\_

11. Researchers have developed a birth control vaccine that would be given once a year. This vaccine is made from a fragment of HCG attached to a protein. The vaccine causes a woman to manufacture antibodies that bind to HCG molecules (when present) in the blood. The antibodies prevent HCG from functioning and thereby affect the implantation of a blastocyst (embryo).
- The vaccine affects the permanent implantation of a blastocyst by indirectly causing
- disintegration of the endometrium
  - increased progesterone production
  - development of new follicles in the ovary
  - inhibition of the movement of cilia in the Fallopian tubes
12. The onset of labour at the end of pregnancy is caused partly by a decreased level of
- |             |                 |
|-------------|-----------------|
| A. LH       | B. FSH          |
| C. estrogen | D. progesterone |
13. Which of the steps of human development occurs after chorion development?
- Fertilization
  - Implantation
  - Cleavage (division of the zygote by mitosis)
  - Organogenesis (the formation of body organs and systems)

14. *In vitro* fertilization techniques can enable postmenopausal women (those who have gone through menopause) to have babies. Eggs are removed from a female donor and are fertilized in a culture dish. The early embryo is inserted into the uterus of the postmenopausal woman. The postmenopausal woman requires hormone supplements for implantation and development to succeed.

After *in vitro* fertilization, hormone supplements are administered until the fourth month of pregnancy. At this time, the hormone supplements may be discontinued because the

- placenta produces oxytocin to inhibit uterine contraction
- pituitary produces oxytocin to inhibit uterine contraction
- placenta produces progesterone and estrogen to maintain the uterine lining
- pituitary produces progesterone and estrogen to maintain the uterine lining

15. In male and female embryos, the development of the genital ridge influences gender determination. The male and female genotypes (sex chromosomes) differ in that they cause the release of different hormones from the genital ridge in males and females during development.

Which of the following statements about normal embryonic hormone secretion is correct?

- The X chromosome secretes estrogen in a female embryo.
- The Y chromosome secretes testosterone in a male embryo.
- The genital ridge produces estrogen in a potential female embryo.
- The genital ridge produces testosterone in a potential female embryo.

### Numerical Response

#### 4. Some Events in the Human Reproductive Cycle

- Pre-embryo releases HCG, which maintains hormone levels
- A hormone signals the follicle to rupture
- Blastocyst is implanted
- The egg is fertilized to form a zygote.

The above events, in the sequence in which they occur during the reproductive cycle, are \_\_\_\_\_

(Record your four-digit answer.)



16. The genital tract of both females and males can play host to many disease-causing microbes. The sexually transmitted diseases (STDs) that can result include gonorrhea, syphilis, herpes, AIDS, genital warts, and chlamydia. These diseases, if untreated, may lead to brain and nervous system deterioration, circulatory system damage, cancer, and infertility. Microbes may pass from mother to child during pregnancy and birth.

STD microbes may be transmitted to the

- A. child in the vagina
- B. zygote in the endometrium
- C. embryo by the ingestion of amniotic fluid
- D. fetus by the entry of blood from the uterine veins

- a. The birth weights of the infants were adjusted for maternal height, sex of infant, and the length of pregnancy. Using one of these variables, explain the purpose of adjusting the birth weights prior to the analysis of the results. [1]
- b. Draw a bar graph that illustrates the differences in average birth weight of infants born to women in the five categories of smoking habit. [3]

**WRITTEN RESPONSE - 12 marks**

1. An association between smoking during pregnancy and adverse pregnancy outcomes has long been known. In contrast to babies born to mothers who do not smoke, babies born to smoking mothers have lower birth weights, stay longer in hospital, and are more likely to be delayed in mental and physical development.

An interesting observation is that fetuses of mothers who smoke have placentas that are thinner and heavier and that have a larger surface area than placentas of fetuses of non-smoking mothers.

A study was conducted of 1 512 pregnant women who were at an average gestational stage of 14 weeks. Information about smoking history, inhalation habits, and exposure to other smokers in the household was gathered.

Birth weights of infants born to these women were measured and adjusted for maternal height, sex of infant, and the length of pregnancy. Average weights of infants were calculated and recorded for five categories of smoking habit of mothers.

**Table 1: Smoking Habit Reported at Initial Interviews and Average Birth Weight (total sample size = 1 512)**

Smoking habit	Number	Average Birth Weight (Grams)
<b>Non-smokers</b>		
never smoked	400	3 678
stopped before this pregnancy	492	3 671
stopped early in this pregnancy	130	3 671
<b>Total and Overall Average</b>	<b>1 022</b>	<b>3 675</b>
<b>Smokers</b>		
1-14 cigarettes per day	336	3 535
15+ cigarettes per day	154	3 434
<b>Total and Overall Average</b>	<b>490</b>	<b>3 504</b>

—from *Effects of Smoking on the Fetus, Neonate, and Child* and Rodger Doyle © 1996 *Scientific American*

- c. What conclusion might be drawn from analysis of these data? Identify four other factors about the women's histories that should be considered before accepting any conclusions indicated by the data.

- i. Conclusion:
- ii. Factors: [3]

Nicotine and carbon monoxide are two components of cigarette smoke that have been studied extensively.

Nicotine mimics a naturally produced chemical that stimulates neurotransmitter receptor sites on some dendrites. Therefore, nicotine's first effect is to stimulate neurons. Nicotine is not easily broken down, however, and it ultimately blocks the receptor sites, preventing further neural signals. As well, nicotine stimulates the release of epinephrine, which in turn causes the diversion of blood from most of the mother's organs to her skeletal muscles.

Carbon monoxide binds to hemoglobin more easily than oxygen does, thereby reducing the oxygen-carrying ability of the blood. As a result, smokers tend to have lower blood oxygen levels, a condition known as hypoxia.

—from *Effects of Smoking on the Fetus, Neonate, and Child* and Rodger Doyle © 1996, *Scientific American*

... cont'd next page

- d. Explain how exposure to nicotine and carbon monoxide could result in reduced fetal growth and a lower birth weight in infants. [2]
- e. Explain how the observed changes in the placenta of a mother who smokes could be a physiological response to overcome the difficulties created by smoking. [1]
- f. Realistically, how would you influence women not to smoke during pregnancy? [2]

\* \* \* \* \*

## Written Response

**One or more of the following written response questions will be on the unit final. Be prepared to answer each one of them if you have to!**

1. Doris is a 32 year-old pregnant female who is 2 weeks over due. Her physicians decide to induce labour by giving her a series of drugs which will influence the levels of 4 different hormones within her system. Speculate and describe what these hormones are and explain how these drugs will influence the levels of these hormones.
2. Briefly describe significant occurrences during each trimester of pre-natal development. include at least three specific items for each of the three trimesters.
3. The drug, Depo-Provera, when taken regularly inhibits the production of testosterone by altering the receptor sites of the interstitial cells of Leydig. Describe the effects Depo-Provera would have upon FSH, LH, and testosterone levels. Conclude by explaining how this drug would affect both male fertility and male secondary sexual characteristics.
4. Create a diagram which illustrates the distinct germ layers found within the growing blastocyst. Beside each layer identify two organs or accessory structures that are derived from each layer.